

Name: _____

INTRODUCTION TO THE PERIODIC TABLE

Chapter Outline

3.1 → Development of the Modern Periodic Table

Vocabulary

periodicity
law of octaves

periodic law

triads

Objectives

- **Outline** the steps in the historical development of the periodic table.
- **Predict** similarities in properties of the elements by using the periodic table.

3.2 → Classification of the Elements

Vocabulary

period
metal
actinide
semiconductor
alkaline earth metal
halogen

group
transition element
nonmetal
representative element
transition metal

noble gas
lanthanide
metalloid
alkali metal
inner transition metal

Objectives

- **Identify** key features of the periodic table.
- **Use** the periodic table to classify an element as a metal, nonmetal, or metalloid.
- **Compare** the properties of metals, nonmetals, and metalloids.

3.3 → Periodic Trends

Vocabulary

electronegativity

ion

octet rule

Objectives

- **Relate** an element's valence electron structure to its position in the periodic table.
- **Compare** period and group trends of several properties.

Chapter 3 Schedule for Chemistry 313

2	3	4	5	6	7
	Keystone Test Prep		Secret Agent Snom	Activity: Mendeleev's Notes: Development	Activity: Colored per Notes: Organization
9	10	11	12	13-2+3	14
	Notes: Periodic The Practice: PT worksheet	Pre-lab: Chemical F	Due Homework #1 Homework Quiz #1 Lab: Chemical Rea	No Class 2+3	Post-Lab: Chemical
16	17	18	19	20	21
	Activity: Study Guide	Activity: Review Day	Test Chapter 3		

Chapter Notes Outline

1. The Search for a Periodic Table

- Chemists wanted to organize the elements into a system that would show _____ while _____.
 - _____ was used as the basis.
- J.W. _____ (1829)
 - Classified some elements with similar properties into groups of three called _____
 - Their properties varied in an orderly way according to their atomic masses.
- John _____ (1864)
 - Created the _____, which stated that the properties of the elements repeated every eighth element
- Dmitri _____ (1869)
 - Arranged the elements in order of _____ into _____ with _____
 - Predicted the existence and properties of undiscovered elements
 - Showed that the properties of the elements repeat in an orderly way from row to row of the table
 - _____ is the tendency to recur at regular intervals.
- Henry _____ (1913)
 - Discovered that atoms of each element contain a unique number of protons in their nuclei (=atomic number)
 - Arranged the elements in order of _____ to show a clear periodic pattern of properties
 - The statement that the physical and chemical properties of the elements repeat in a regular pattern when they are arranged in order of increasing atomic number is known as the _____

The periodic table is a grid of elements, each represented by a block. The blocks are color-coded by state of matter: Gas (light blue), Liquid (dark blue), Solid (grey), and Synthetic (yellow). The height of each block corresponds to its atomic number. The periodic table is labeled with 'Element', 'Symbol', and 'Atomic mass' for Hydrogen. A legend on the right shows the four states of matter. The periodic table is also labeled with 'Metal', 'Metalloid', 'Nonmetal', and 'Recently discovered'.

The periodic table is organized into groups (columns) and periods (rows). The groups are labeled 1A through 8A, and the periods are labeled 1 through 7. The elements are arranged in order of increasing atomic number.

The periodic table is a grid of elements, each represented by a block. The blocks are color-coded by state of matter: Gas (light blue), Liquid (dark blue), Solid (grey), and Synthetic (yellow). The height of each block corresponds to its atomic number. The periodic table is labeled with 'Element', 'Symbol', and 'Atomic mass' for Hydrogen. A legend on the right shows the four states of matter. The periodic table is also labeled with 'Metal', 'Metalloid', 'Nonmetal', and 'Recently discovered'.

Classification of the Elements

2. The Modern Periodic Table...

- Elements are arranged in order of increasing atomic number into a series of columns, called _____ (or families), and rows, called _____.
- The groups designated with an "A" are often referred to as the main group, or _____.
- The groups designated with a "B" are referred to as the _____.

Atomic number	8	Oxygen	Element
Symbol	O		State of matter
	15.999		Atomic mass

3. _____ are elements that are generally shiny when smooth and clean, solid at room temperature, and good conductors of heat and electricity.

- _____ elements (except for hydrogen) are known as the _____.
- _____ elements are known as the _____.
- _____ elements (transition elements) are divided into _____ and _____.
- o _____ and _____

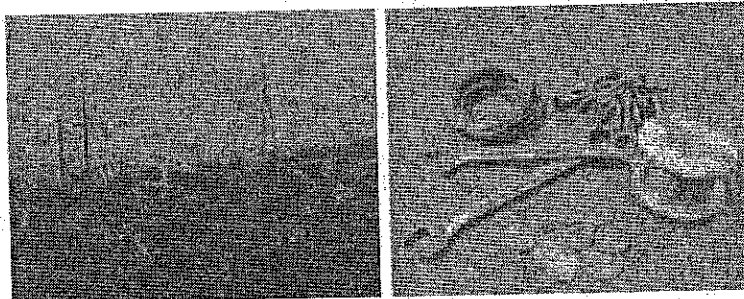


Figure 6-6

Metals are used in a wide variety of applications. The excellent electrical conductivity of metals such as copper, makes them a good choice for transmitting electrical power. Ductility and malleability allow metals to be formed into coins, tools, fasteners, and wires.

4. _____ are elements that are generally gases or brittle, dull-looking solids, and poor conductors of heat and electricity.


- _____ elements are known as the _____.
- _____ elements are known as the _____.

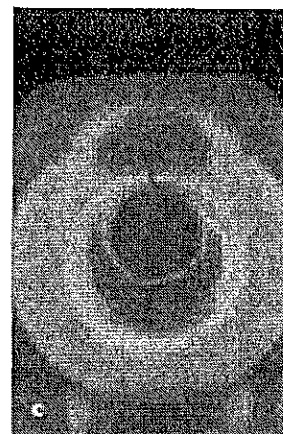


a A mountain climber breathes from a container of compressed oxygen gas, a nonmetal

5. _____ are elements with physical and chemical properties of both metals and nonmetals.

▪ _____

 Silicon crystals, a metalloid, are grown in an inert atmosphere of argon, a nonmetal. The crystals are used in the manufacture of computer chips.



Periodic Trends

6. Atomic Radius...

- Trends within periods


○ _____

atomic radii as you move _____ across a period

- Trends within groups

○ _____ in atomic radii as you move _____ a group

	1A	2A	3A	4A	5A	6A	7A	8A
1	H 37							He 31
2	Li 152	Be 112	B 85	C 77	N 75	O 73	F 72	Ne 71
3	Na 186	Mg 160	Al 143	Si 118	P 110	S 103	Cl 100	Ar 98
4	K 227	Ca 197	Ga 135	Ge 122	As 120	Se 119	Br 114	Kr 112
5	Rb 248	Sr 215	In 167	Sn 140	Sb 140	Te 142	I 133	Xe 131
6	Cs 265	Ba 222	Tl 170	Pb 146	Bi 150	Po 168	At 140	Rn 140

K 227	Chemical symbol
227	Atomic radius
	Relative size

7. Electronegativity...

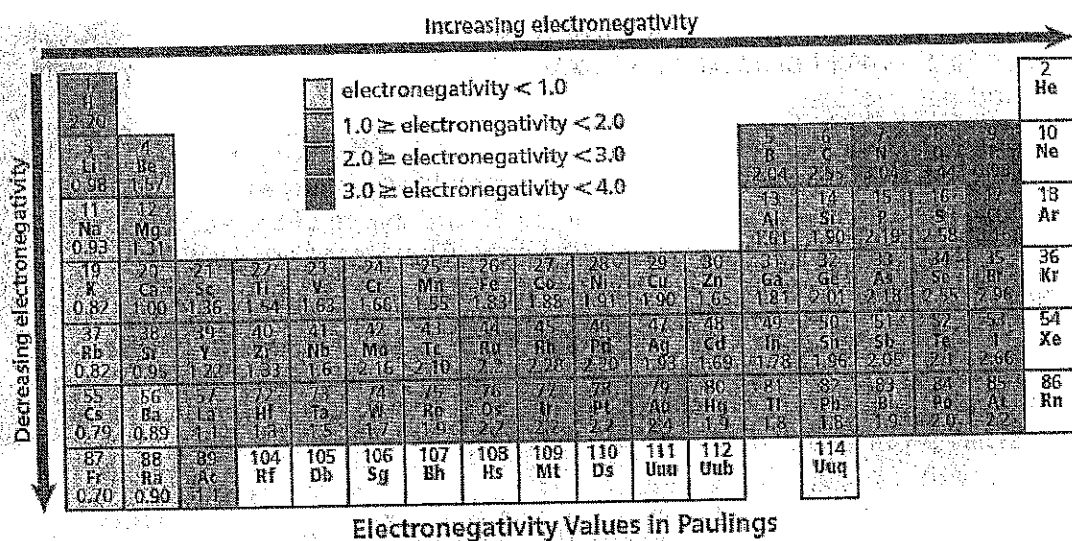
- The _____ of an element indicates the relative ability of its atoms to attract electrons in a chemical bond.

- Trend within periods

○ _____ as you move _____ across a period

- Trend within groups

○ _____ as you move _____ a group



8. Valence Electrons...

- Atoms in the same group have _____ because they have the _____.
- The _____ of an atom's valence electrons indicate the _____ in which it is found.
- A representative element's _____ and the _____ it contains are equal (with a few exceptions).
- Atoms can gain or lose one or more electrons and acquire a net charge.
 - An _____ is an atom or a bonded group of atoms that has a positive or negative charge.
 - The _____ states that atoms tend to gain, lose, or share electrons in order to acquire a full set of _____.

Name: _____

Score: _____ / 30
Chemistry 313
Chapter 3

HOMework #1

1. What is the modern periodic law? How does it differ from Mendeleev's periodic law?
2 POINTS

2. What are 2 factors that contributed to the widespread acceptance of Mendeleev's periodic table?
2 POINTS

3. Which of Dobereiner's triads shown are still listed in the same column of the modern periodic table?
1 POINT

<i>Triad 1</i>	<i>Triad 2</i>	<i>Triad 3</i>
lithium (Li)	manganese (Mn)	sulfur (S)
sodium (Na)	chromium (Cr)	selenium (Se)
potassium (K)	iron (Fe)	tellurium (Te)

4. Use the periodic table to separate these 12 elements into 6 pairs of elements having similar properties.
3 POINTS

Ca, K, Ga, P, Si, Rb, B, Sr, Sn, Cl, Bi, Br

5. Use the periodic table to identify by name and symbol the elements that have the following atomic masses:
2 POINTS

- a. 30.974 amu _____ _____
b. 137.327 amu _____ _____
c. 18.998 amu _____ _____
d. 118.710 amu _____ _____

HOMEWORK #2

1. Describe element number 18 in terms of its period number, group number, and family name. 1 POINT

2. What is the group number of each of the following families of elements? Write the symbols for the elements in each family. 4 POINTS

- a. alkali metals _____
- b. halogens _____
- c. alkaline earth metals _____
- d. noble gases _____

3. Select the symbol of the element that fits the following descriptions. 5 POINTS

- a. the group 13 metal in the 3rd period _____
- b. the group 15 metalloid in the 4th period _____
- c. the lightest of the noble gases _____
- d. the halogen that exists as a liquid at room temperature _____
- e. the only metal that is a liquid at room temperature _____

HOMEWORK #3

1. How many valence electrons are in an atom of each of the following elements, and what ion would each atom form? 4 POINTS

a. Ne	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	e. Br	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>
b. S	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	f. Sr	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>
c. Na	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	g. As	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>
d. Sn	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	h. In	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>

2. Write > (greater than) or < (less than) to indicate how the electronegativities of the following elements compare. 6 POINTS

a. Cl	<div style="border: 1px solid black; width: 40px; height: 40px; display: inline-block;"></div>	F	e. Mg	<div style="border: 1px solid black; width: 40px; height: 40px; display: inline-block;"></div>	Ca
b. C	<div style="border: 1px solid black; width: 40px; height: 40px; display: inline-block;"></div>	N	f. Bi	<div style="border: 1px solid black; width: 40px; height: 40px; display: inline-block;"></div>	P
c. Kr	<div style="border: 1px solid black; width: 40px; height: 40px; display: inline-block;"></div>	Ar	g. Ca	<div style="border: 1px solid black; width: 40px; height: 40px; display: inline-block;"></div>	K

Name: _____

Score: _____ / 15
Chemistry 313
Chapter 3

INTRODUCTION TO THE PERIODIC TABLE
Study Guide

1. Define the following terms.

a. periodicity

b. periodic law

c. period

d. group

e. noble gas

f. metal

g. transition element

h. lanthanide

i. actinide

j. nonmetal

k. metalloid

l. semiconductor

m. triad

n. law of octaves

o. alkaline earth metal

p. halogen

q. representative element

r. transition metal

s. alkali metal

t. inner transition metal

u. electronegativity

v. ion

w. octet rule

2. Use the periodic table to identify the following elements. Write the element name and the element symbol.

a. This element has an atomic mass of 207.2 amu.

b. This element can be found in group 4, period 5.

c. This element is a nonmetal and a liquid at room temperature.

d. This element has 6 valence electrons in the 2nd energy level.

e. Atoms of this element contain 30 protons in their nucleus.

f. This element has an atomic mass of 20.180 amu.

3. Use the periodic table to separate these 6 elements into 3 pairs of elements having similar properties.

Ni, He, Ba, Kr, Ca, and Pt

a.

b.

c.

4. What is the trend in electronegativity as you go across a period and down a group?

5. Determine the number of valence electrons in each atom below and write the charge of ion it would form in a chemical bond.

a. radium

b. neon

c. carbon

d. phosphorus

6. What are the major differences in the physical properties of metals, nonmetals, and metalloids?
